KENYA MARINE AND FISHERIES RESEARCH INSTITUTE

FRESH WATER SYSTEMS

FACT SHEET

A technical report on mapping macro litter abundance, community perceptions and their participation in addressing litter within Lake Turkana



Macro litter is any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment. Key causes of high macro litter abundance include land-based sources like inadequate waste discharge and mismanaged waste, as well as sea-based sources from shipping and fishing. Environmental pollution due to mismanaged anthropogenic litter is one of the most pressing issues facing the world today, and evidence of its negative socioeconomic, cultural, health, and ecological implications is well documented

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TECHNICAL REPORT

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EXECUTIVE SUMMARY

Due to mismanaged environmental pollution, anthropogenic litter is one of the most pressing issues facing the world today. Macro litter abundance refers to the quantity and distribution of large pieces of persistent synthetic materials, like plastics etc. in a given environment, with marine environments and coastal areas being particularly affected. Macro litter especially plastic litter suffocates both terrestrial and aquatic environment hence the need to mitigate its proliferation. This calls for the need to assess their proliferation, identify sources and quantify the extent of their disposal to the aquatic resource. Lake Turkana is one those aquatic environments that are facing the threats. This study therefore aims at assessing the extent of macro litter along the Lake, assess the community perception and participation on the same and make recommendations for management decision. Data collection was taken along the western shore of the Lake with quadrats being used to estimate the area for sample collection while semi structured questionnaires being administered on the community perception and participation. Results showed that Namakat exhibited high level of macro litter followed by Todonyang while Lowarangak and Eliye had the lowest. Plastics had the highest quantity in composition (63%) amongst the macro litter identified in general. This could be attributed to the fact that plastic is the major packaging material for use on major products used by the community in the area. This is followed by metal and clothing (17%) and 12% respectively while the list was ceramic. Community perceived macro litter as nuisance and disturbing but their participation in its management was negligible. The need to establish collection points in the area including creation of awareness on the effect of Maro litter pollution on both human beings' health and the health of the surrounding water body was therefore recommended. It was also recommended that the NEMA regulations on use of plastic/macro litters be observed with enforcement to reduce plastic proliferation and use.

Key words: **Macro litter, Plastic, Community, Lake Turkana**

INTRODUCTION

Macro litter abundance refers to the quantity and distribution of large pieces of persistent synthetic materials, like plastics, in a given environment, with marine environments and coastal areas being particularly affected. According to UNEP (2005) "Marine litter is any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment". Abundance varies significantly by location, but overall trends in some areas, such as the EU, show a decreasing trend in litter, while other regions struggle with high contamination levels due to poor waste management. Key causes of high macro litter abundance include land-based sources like inadequate waste discharge and mismanaged waste, as well as sea-based sources from shipping and fishing. Environmental pollution due to mismanaged anthropogenic litter is one of the most pressing issues facing the world today, and evidence of its negative socioeconomic, cultural, health, and ecological implications is well documented (Gall and Thompson 2015; Law 2017; Beaumont et al. 2019). Litter comprising different material types, such as plastics, cloth, metal, wood, ceramic, glass, rubber, and paper, is generated from different sources, including homes, tourism, fishing, shipping, and commercial sectors (Barnardo and Ribbink 2020). The majority of anthropogenic litter is not collected and disposed of sufficiently hence accumulates in the environment (Lebreton et al. 2017). Plastics are considered most problematic for the environment of all the anthropogenic litter types owing to its durability, persistence, and widespread usage (Corcoran et al. 2009). The quantification of marine debris received increasing attention in recent studies due to the high accumulation rates of anthropogenic items in this ecosystem. This places special emphasis on plastic items because of their predominance caused by low degradation rates in contrast to other materials (Andrady, 2015). Plastic pollution is found globally from deserts to farms, from mountaintops to the deep ocean, in tropical landfills and in Arctic snow. Reports of plastic debris in the marine environment date back half a century (Carpenter *et al,* 1972), with continuing accumulation on the ocean surface over the past 60 years. It has been estimated that 9.2 billion tons of plastic have been made between 1950 and 2017.

A study by Okuku *et al* 2020 indicated that marine litter pollution particularly by plastics was widespread in all studied Kenya coastal counties. However, a significant amount of litter encountered in the beaches was of local origin, thus a local solution to waste management will considerably reduce marine litter pollution in Kenya. Emissions of plastic are increasing and will continue to do so even in some of the

most optimistic future scenarios of plastic waste reduction (Borelle *et al*., 2020). Estimates of global emissions of plastic waste to rivers, lakes, and the ocean range from 9 to 23 million metric tons per year, with a similar amount emitted into the terrestrial environment, from 13 to 25 million metric tons per year as of 2016 (Borelle *et al*., 2020). In Lake Turkana, especially along the Ferguson's Gulf, there are a number of activities that involve the purchase and use of plastic products in the informal settlement areas. A number of small and micro enterprise activities serve the fisher communities around the Gulf. These enterprises sell products that involve use of plastics or are plastic in nature. Water containers, sweet's rappers, cold drinks etc. are major products. Fish nets especially monofilaments are always found everywhere in addition to energy drink bottles being used by fishermen as floaters on those nets. Further, small streams upstream like Napasnyang' etc. flow to the lake carrying debris upstream. Rivers Kerio and Tuckwell flow long distance and pose a risk of carrying floating macro litter/debris with them to the lake. All these threaten the lake in terms of macro litter settlement at the shore and shallow water body environments. Estimates of global emissions of plastic waste to rivers, lakes, and the ocean range from 9 to 23 million metric tons per year, with a similar amount emitted into the terrestrial environment, from 13 to 25 million metric tons per year as of 2016 (Borelle *et al*., 2020). To reduce plastic litter and anthropogenic litter in general, clean up events have increased globally (Vincent et al. 2017; Syberg et al. 2020; Aslam et al. 2022; Catarino et al. 2023.). Clean-ups, typically focusing on beaches and coastal regions (Nelms et al. 2017), have become popular not only in reducing visible amounts of litter, but also for their efforts in community outreach, education, and the involvement of citizen scientists (Syberg et al. 2020; Catarino et al. 2023), where the term citizen science specifically refers to members of the public voluntarily participating in the scientific process through, for example, the collection of samples and/or data (Syberg et al. 2018). Additionally, clean-ups are becoming scientifically valuable in collecting data and providing real-time comparable results from previously unreported areas and on the relative importance of different types of anthropogenic litter (Nelms et al. 2022; Catarino et al. 2023).

Material and methods

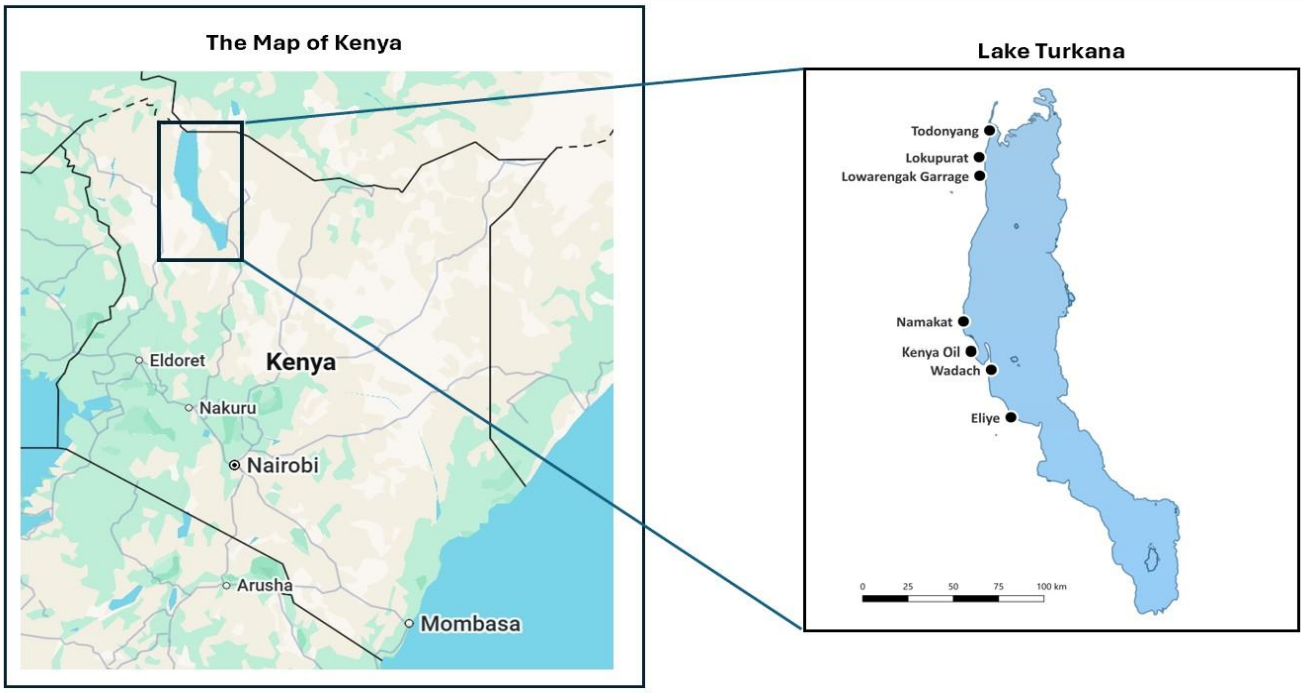


Figure 1: Map of lake Turkana showing the sampling sites

Lake Turkana, is lying within the Great Rift Valley Northern Kenya. The Lake is 250 km long, having an elevation of 360 m above sea level and a maximum depth of about 120 m. Lake Turkana has a surface area of 7,500 km^2 making it the largest Lake in Kenya. A total of seven study sites were identified for this study as indicated in Figure 2. In the norther part of the Lake, three stations were identified namely Todonyang, Lokuprat and Lowarangak. The sites have high fishing activity and high fisherfolk population staying in infromal settlements along the shore and its vicinity. An area of about (10 x 10) square meter was marked for macro litter collection (Figure 3 a, b, c, d). The area was designed to end at the shoreline to ensure the litter cuts across the land to the highest water mark. Community around the selected sites were involved in macro litter collection. Three sampling points were established for each site, and all debris were collected and place on a gunny bag until all debris were cleared out of the selected sites. For each site, all the debris were differentiated and weighed. GPS of the area was marked for ease of reference. After the collection and identification of the debris, a semi structured questionnaire was administered to the locals to determine their perception participation on the macro litter menace or mitigation. This was followed by a key informant questionnaire targeting the opinion leaders and administrators. The results were compiled and recorded for analysis.

RESULTS

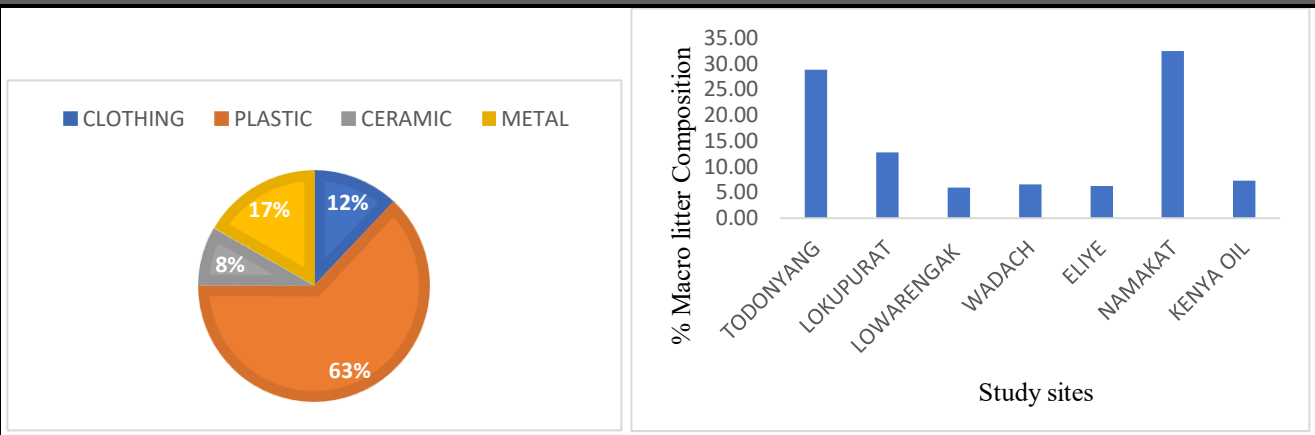


Figure 2: Composition (%) of different types of Macro litter and composition (%) in different sites along Lake Turkana

Macro litter in Lake Turkana is mainly attributed to human activity. Most of the litter is compost of 65% plastic which are packaging material from the people settling in the landing sites. Figure 4 shows clearly that plastic is the majority followed by clothing and metal. These are products mainly used by people entirely hence the main contributor to the litter

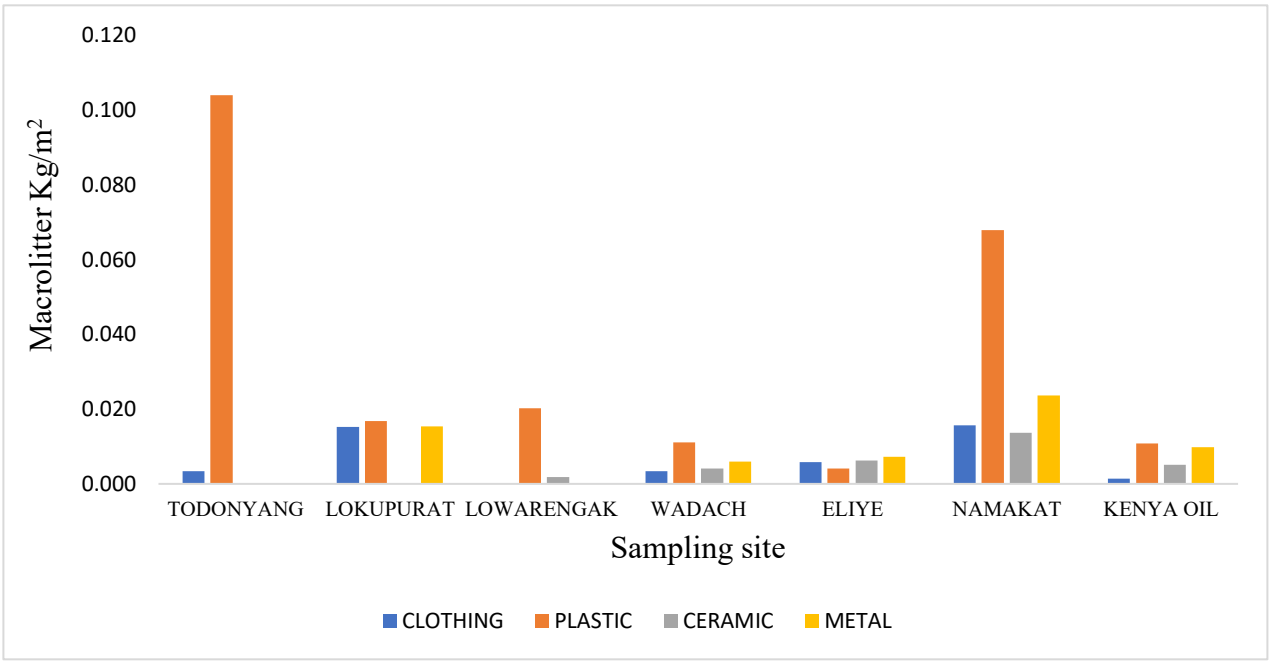


Figure 3: Types of Macro litter in the sampled sites along Lake Turkana

Results showed that, Namakat, had the highest quantity of macro litter, followed by Todonyang and Lokupurat and the least was Lowarangak. As much as Lowarangak have higher population, the settlement is situated far from the Lake hence the reduced macro litter disposal making the shore less macro litter waste free

Results show that different stations/sites had different intensity of Macro litters. Considering the intensity of macro litter in various sites per square meter, Todonyang leads in concentration of plastic of above 0.1Kg/m^2

Table 1:Results of Community perception and participation on macro litter along Lake Turkana

	Questions (N=31)	**Response**	**Number**	**Responses%**
1	Where do you throw your waste	Any how	9	29
		selected place	13	42
		Dustbin	6	19
		particular spot	3	10
2	Do litter around you disturb your mind	Yes	31	100
		No	0	0
		Do not know	0	0
3	Where do litter come from	Brought by people	13	42
		Brought by wind	18	58
4	Are you aware if litter can harm you	Yes	29	94
		No	2	6
5	Are they a nuisance to you	Yes	28	90
		No	3	10
6	Who are most affected by litter	Children	5	16
		None	1	3
		All	25	81
7	Of the litter categories which is most nuisance	Plastic	24	77
		Metals	1	3
		Glass	2	6
		Paper	2	6
		Fish waste	0	0
		Others	2	6
8	Whom do we blame for the litter	Individuals	7	23
		Residents	12	39
		Law enforcers	3	10
		None	9	29

9	Are you aware of NEMA Laws	Yes	18	58
		No	13	42
10	How do we eradicate the litter	Enforce law, create awareness, task people to be responsible, create dumping site	19	61
		Others	1	3
		Create awareness	6	19
		Create dumping site	4	13
		Put dumping bins	1	3

While majority indicated that they have a selected place for dumping. Only 19% said they had a dumping site. All respondents agreed that the litter disturbs their mind but had little to do on the same.as much as the litter were a nuisance to then, almost 50% of the respondents agreed that the litter are brought by people while the other half believed it is the act of the wind. The respondents (81%) indicated that all the individuals can be affected with the litter irrespective of the age with 98% of them saying that they are aware that litter can harm them equally.

CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusion

Macro litter was found in all stations in significant level with Plastics having the biggest share in terms of litter menace

Human activities happen to contribute heavily in the accumulation of litter in various settlement areas

The participation of the people living along Lake Turkana shoreline in managing the macro litter is negligible.

4.2 Recommendations

There is need to establish collection points in the area to contain the spread of plastics to the water and settlement areas.

NEMA regulations on use of plastic bags be observed with enforcement to reduce plastic proliferation and use.

Capacity building and creation of awareness should be given priority to ensure people become responsible for their actions